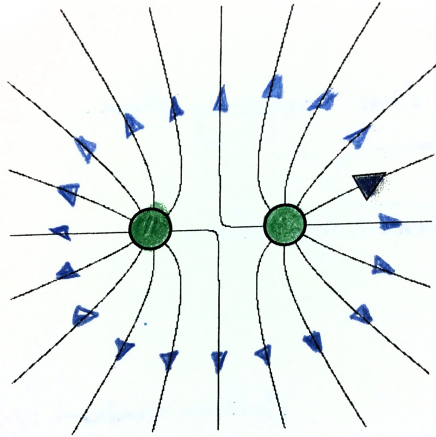


The E-Field Coloring Book

Color the following diagrams appropriately using the rules in the box at right and answer any questions associated with each diagram. Don't forget to include directions on all field lines (in the center of the line, not at the ends). If there's no way to figure out which sign a charge has, put a "?" in the middle of it instead of a "+" or "-" sign with the correct color.

- All + charges should be colored GREEN
- All - charges should be colored RED
- Draw BLUE ARROWS in the center of field lines indicating their direction



Are these two charges **LIKES** or OPPOSITES ?

The program used to draw these images draws the same number of field lines from a charge as the magnitude of the charge (i.e. a 4 C charge would have 4 field lines coming from it). Do these two charges have the same magnitude?

Yes

If not, which one is larger?

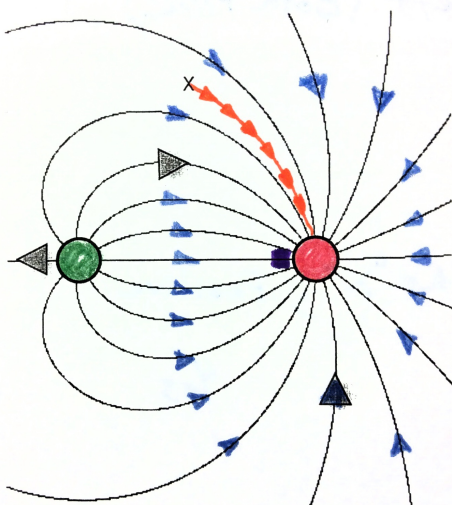
Same charges

If you put a very small negatively charged object halfway between the two charges, what would happen to it?

Stay still (pulled equally by both charges)

Would you give the same answer if the above question had asked about a positively charged object placed there? Explain.

Yes (except it would be pushed equally)



Are these two charges LIKES or **OPPOSITES** ?

Do these two charges have the same magnitude? No

If not, which one is larger? Negative (on right)

What is its charge in Coulombs? -20 C

If you put a small positive charge at the spot marked by an X, draw a small orange curve or line showing the path you think it would follow (you can stop once you reach the dark line or a charge).

On the horizontal line connecting the two charges, draw a small purple square where the force is the largest. (You may have to check your notes to see how a field diagram shows this!)

Just a mini-review:

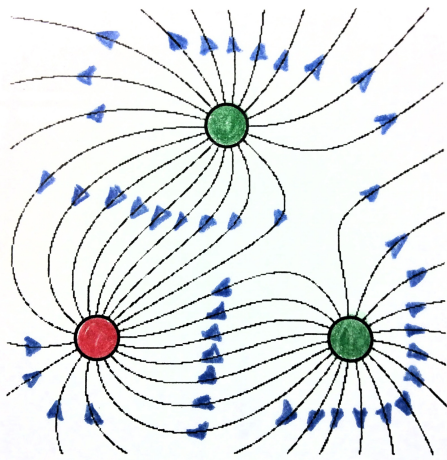
E-field lines ALWAYS SOMETIMES **NEVER** cross each other.

E-field lines always leave **POSITIVE** NEGATIVE NEUTRAL charges and enter POSITIVE **NEGATIVE** NEUTRAL ones.

E-field lines show the direction of the **FORCE** CHARGE DISPLACEMENT acting on a charged particle at any point along them.

E-field lines point in the direction a **POSITIVE** NEGATIVE NEUTRAL charge would move.

E-field lines are a combination of these two men's electrostatics laws: Franklin & Coulomb



COLOR the lower left charge RED before beginning this one...

Are all three of the charges in this picture equal in magnitude? **Yes**

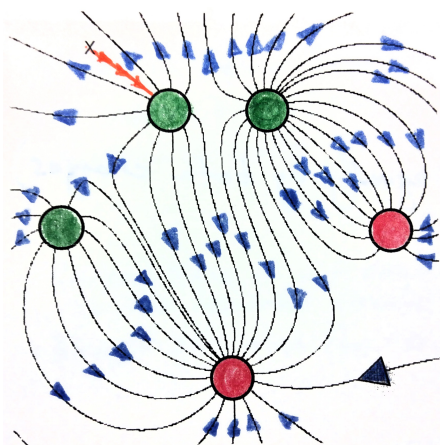
What is the charge of the uppermost charged object? **+ 20 C**

Are the two rightmost charges **LIKES** or OPPOSITES ? Explain.

They do not have field lines connecting them.

Are the two lower charges LIKES or **OPPOSITES** ? Explain.

They have field lines connecting them.



Only one arrow to get you started on this one! Think you can figure out all of the charges and their signs? **Yes**

Which of the charges has the largest NEGATIVE charge? **Bottom center**

How big is that charge? **- 21 C**

How does the largest POSITIVE charge on any object in this diagram compare to the largest NEGATIVE charge shown?

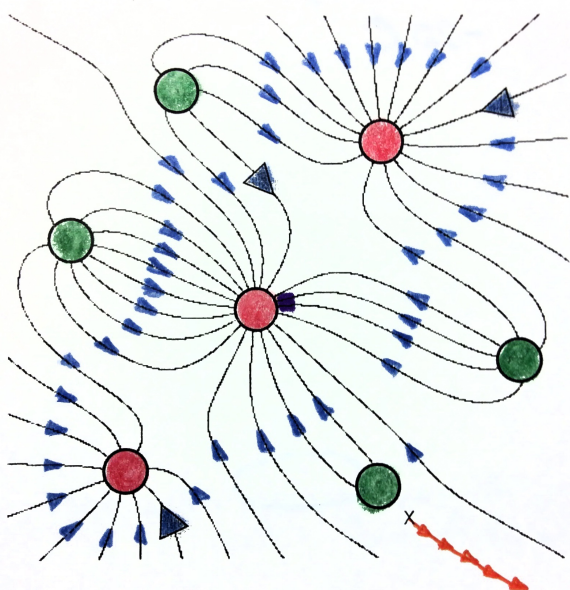
Same magnitude (upper right has a charge of + 21 C)

Which charges have the same magnitude and sign?

The two at upper left have + 10 C each

Describe how an electron placed at the spot marked by an "X" would move (drawing in an orange "flight" path would be a good idea, too.)

Toward the nearest + charge on a path parallel to the field lines it's between



Which of the charges shown has the smallest magnitude, and what is that charge's sign?

The charge in the lower right (by the "X"); Positive

Is the charge in the middle the largest in magnitude? **Yes**

What's its sign? **Negative**

Using an orange line or curve, show the path of a proton originally placed at the "X."

Are the three charges in a straight line (from upper right to lower left)

LIKES or OPPOSITES ?

Explain how you could tell that from the three arrows initially drawn...

All have arrows going toward them, so they are all negatively charged

One small region shown has the greatest forces. Once again, draw a **small** purple square in the region of greatest force.